

Links to Standards:

Intro to Nanoscale: Surface Area to Volume Ratio Module

Activity 1: Same Material—Different Behavior

STANDARDS:

NSES Physical Science *Chemical Reactions*

Chemical reactions can take place in time periods ranging ... Reaction rates depend on how often the reacting atoms and molecules encounter one another, on the temperature, and on the properties—including shape—of the reacting species.

AAAS 2061 Structure of Matter *Chemical Reactions*

The rate of reactions among atoms and molecules depends on how often they encounter one another, which is affected by the concentration, pressure, and temperature of the reacting materials.

NCTM Geometry

Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest ...

NSES Science as Inquiry *Abilities Necessary to Do Scientific Inquiry*

Formulate and revise scientific explanations and models using logic and evidence.

Activity 2: Powers of 10 and Scale

STANDARDS:

NCTM Numbers and Operations: Develop a deeper understanding of very large and very small numbers and of various representations of them.

AAAS 2061 Common Themes *Scale: Represent Numbers:*

Representing large numbers in terms of powers of ten makes it easier to think about them and to compare things that are greatly different.

AAAS 2061 Habits of Mind *Computation and Estimation: Compare Numbers:*

Express and compare very small and very large numbers using powers-of-ten notation.

AAAS 2061 Habits of Mind *Computation and Estimation Ratios and Proportions:*

Use ratios and proportions, including constant rates, in appropriate problems.

NCTM Geometry: Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.

AAAS 2061 Habits of Mind *Computation and Estimation Models:*

Models are often used to think about processes that happen too slowly, too quickly, or on too small a scale to observe directly, or that are too vast to be changed deliberately, or that are potentially dangerous.

NSES Unifying Concepts and Processes *Systems, Order, and Organization* *Models:*

Models are tentative schemes or structures that correspond to real objects, events, or classes of events, and that have explanatory power. Models help scientists and engineers understand how things work. Models take many forms, including physical objects, plans, mental constructs, mathematical equations, and computer simulations.

NCTM Numbers and Operations

Create and use representations to organize, record, and communicate mathematical ideas.

Activity 3: Surface Area and Volume

STANDARDS:

AAAS 2061 Mathematical World *Shapes*

When the linear size of a shape changes by some factor, its area and volume change disproportionately: area in proportion to the square of the factor, and volume in proportion to its cube. Properties of an object that depend on its area or volume also change disproportionately.

NCTM Geometry: Analyze properties and determine attributes of 2- and 3-dimensional objects.

NCTM Geometry: Explore relationships ... among classes of 2- and 3-D geometric objects, make and test conjectures about them, and solve problems involving them.

NSES Unifying Concepts and Processes *Systems, Order, and Organization: Models*

Models are tentative schemes or structures that correspond to real objects, events, or classes of events, and that have explanatory power. Models help scientists and engineers understand how things work. Models take many forms, including physical objects, plans, mental constructs, mathematical equations, and computer simulations.

AAAS 2061 Mathematical Representation *Graphical Representation*

Graphs can show a variety of possible relationships between two variables. ...

NCTM Geometry: Use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest

Primary

Secondary